

IN THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Cancelled).
2. (New) A lithographic projection apparatus comprising:
a patterning structure which can be used to pattern a projection beam according to a desired pattern;
a substrate table constructed and arranged to support a substrate;
a projection system constructed and arranged to image the patterned beam onto target portions of the substrate,
an object table positioning system constructed and arranged to position at least one of said patterning structure and said substrate table in a plane, said object table positioning system including:
a first side-beam having a first slider mounted thereon;
a first motor that moves the first slider along the first side beam;
a cross-beam mounted near a first end thereof to said first slider and having a second slider mounted thereon, said cross-beam and said first slider being mounted together so as to form a body that is substantially rigid in translation in said plane and in rotation about an axis normal to said plane, and said second slider having an object holder to hold the at least one of said patterning structure and said substrate table; and
a thrust bearing pivotally mounted to said first slider, said thrust bearing transmitting a force in said plane and substantially perpendicular to said first side beam between said cross-beam and said first side beam.
3. (New) A lithographic projection apparatus as recited in claim 2, wherein said object table positioning system further comprises a second motor that moves said second slider longitudinally to said cross-beam.
4. (New) A lithographic projection apparatus as recited in claim 2, wherein said thrust bearing comprises a bearing assembly which acts against a bearing wall of said first side-beam.

5. (New) A lithographic projection apparatus as recited in claim 4, wherein said bearing wall is substantially parallel to a longitudinal direction of said first side-beam.

6. (New) A lithographic projection apparatus as recited in claim 4, wherein said bearing wall is substantially perpendicular to said plane.

7. (New) A lithographic projection apparatus as recited in claim 4, wherein said bearing assembly is slideable against said bearing wall.

8. (New) A lithographic projection apparatus as recited in claim 4, wherein said thrust bearing further comprises a support member constructed and arranged to carry the bearing assembly.

9. (New) A lithographic projection apparatus as recited in claim 8, wherein said support member is connected to said first slider via a pivot.

10. (New) A lithographic projection apparatus as recited in claim 9, wherein said support member comprises a central portion substantially parallel to said bearing wall, and a first distal end portion and a second distal end portion connected to said central portion, wherein each of said first distal portion and said second distal end portion has a far end opposite another end connected to said central portion, and wherein the far end of said first distal portion and the far end of said second distal end portion are connected to said pivot.

11. (New) A lithographic projection apparatus as recited in claim 8, wherein said support member comprises a leaf-spring arrangement that is substantially rigid in a direction substantially perpendicular to said plane, said leaf-spring arrangement being connected to said first slider.

12. (New) A lithographic projection apparatus as recited in claim 11, wherein said support member further comprises a central portion substantially parallel to said bearing wall, and a first distal end portion and a second distal end portion connected to said central portion, wherein said first distal end portion and said second distal end portion form said leaf-spring

arrangement, and wherein said first distal end portion and said second distal end portion form an acute angle relative to said central portion such that an effective virtual pivot is created within said first slider.

13. (New) A lithographic projection apparatus as recited in claim 12, wherein said virtual pivot is arranged over a center line of a motor track of said first slider.

14. (New) A lithographic projection apparatus as recited in claim 4, wherein said bearing assembly comprises a plurality of bearing pads.

15. (New) A lithographic projection apparatus as recited in claim 4, wherein the bearing assembly has a double-sided pad that acts on opposite faces of said bearing wall.

16. (New) A lithographic projection apparatus as recited in claim 4, wherein said first motor comprises a linear motor having a stator mounted on said first side-beam and an armature mounted on said first slider, said stator comprising a magnet track arranged along a longitudinal direction of said first side-beam.

17. (New) A lithographic projection apparatus as recited in claim 16, wherein said bearing wall extends substantially parallel along the track of said first side-beam.

18. (New) A lithographic projection apparatus as recited in claim 17, wherein said object table positioning system further comprises a linear grating disposed along said magnet track and an incremental encoder disposed on one of said first slider and thrust bearing, said incremental encoder being configured to control said linear motor to drive said first slider to desired positions.

19. (New) A lithographic projection apparatus as recited in claim 18, wherein said thrust bearing is pivotally mounted to said first slider with a pivot located substantially on a center line of said first track.

20. (New) A lithographic projection apparatus comprising:
a patterning structure which can be used to pattern a projection beam according to a desired pattern;
a substrate table constructed and arranged to support a substrate;
a projection system constructed and arranged to image the patterned beam onto target portions of the substrate,
an object table positioning system constructed and arranged to position at least one of said patterning structure and said substrate table in a plane, said object table positioning system including:
first and second side-beams having respective first and second sliders mounted thereon;
first and second motors that move said first and second sliders longitudinally to their respective side beams;
a cross-beam mounted near first and second ends thereof to said first and second sliders respectively and having a third slider mounted thereon, said cross-beam and said first and second sliders being mounted together so as to form a body that is substantially rigid in translation in said plane and in rotation about an axis normal to said plane, and said third slider having an object holder to hold the at least one of said patterning structure and said substrate table; and
a thrust bearing pivotally mounted to said first slider, said thrust bearing comprising a bearing assembly which acts against a bearing wall of said first side-beam.

21. (New) A lithographic projection apparatus as recited in claim 20, wherein said object table positioning system further comprises a third motor that moves said third slider longitudinally to said cross-beam.

22. (New) A lithographic projection apparatus as recited in claim 20, further comprising a second thrust bearing pivotally mounted to said second slider, said second thrust bearing comprising a second bearing assembly which acts against a bearing wall of said second side-beam such that forces generated by translations of said third slider along said cross-beam are transmitted in said plane and perpendicular to said second side beam between said cross-beam and said second side beam.

23. (New) A lithographic projection apparatus as recited in claim 20, wherein said cross-beam is mounted to said first slider with a first joint and to said second slider with a second joint, wherein one of said first joint and said second joint is arranged to be rigid against rotation about an axis substantially perpendicular to a longitudinal direction of said first and second side-beams, and wherein the other one of said first joint and said second joint is arranged to allow rotation about an axis substantially parallel to said longitudinal direction.

24. (New) A method of manufacturing a device comprising:
irradiating portions of a mask and imaging said irradiated portions of the mask onto target portions of a substrate; and

positioning one of a mask bearing moveable object table and a substrate bearing movable object table in a plane prior to or during said irradiating and imaging with a positioning apparatus including:

a first side-beam having a first slider mounted thereon;

a first motor that moves the first slider along the first side beam;

a cross-beam mounted near a first end thereof to said first slider and having a second slider mounted thereon, said cross-beam and said first slider being mounted together so as to form a body that is substantially rigid in translation in said plane and in rotation about an axis normal to said plane, and said second slider having an object holder to hold the at least one of said patterning structure and said substrate table; and

a thrust bearing pivotally mounted to said first slider, said thrust bearing transmitting a force in said plane and substantially perpendicular to said first side beam between said cross-beam and said first side beam.

25. (New) A device manufactured according to the method of claim 24.

26. (New) A positioning apparatus for positioning a moveable object translationally and rotationally in a plane, the apparatus comprising:

a first side-beam having a first slider mounted thereon;

a first motor that moves the first slider along the first side beam;

a cross-beam mounted near a first end thereof to said first slider and having a second slider mounted thereon, said cross-beam and said first slider being mounted together so as to form a body that is substantially rigid in translation in said plane and in rotation about an axis

normal to said plane, and said second slider having an object holder to hold the at least one of said patterning structure and said substrate table; and

a thrust bearing pivotally mounted to said first slider, said thrust bearing transmitting a force in said plane and substantially perpendicular to said first side beam between said cross-beam and said first side beam.